

# 2021 SIS MID Module 5

## Lecture 0: Introduction and Overview

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# Course Details

- ▶ Instructors:
  - ▶ Lecturer: Jon Wakefield (jonno@uw.edu)
  - ▶ Lecturer: Lance Waller (lwaller@emory.edu)
  - ▶ TAs: Taylor Okonek (tokonek@uw.edu) and Yunhan Wu (yunhanwu@uw.edu)
- ▶ Course will be taught remotely over July 12–July 14.
- ▶ Lectures will last for 30–40 minutes ,and then participants will join break out rooms for R sessions.
- ▶ Lectures will be recorded.
- ▶ Questions can also be put in the chat window and then one of the instructors (non-teaching lecturer/TAs) can answer.
- ▶ Course materials are here:  
<http://faculty.washington.edu/jonno/SISMIDspatial.html>

# Course Outline

## DAY 1 (Monday 12 July):

- ▶ Mon 8.00–8.50: **Lecture 1 (Wakefield)** Introduction. Motivation. Data quality
- ▶ Mon 8:50–9.20: **Practical Session 1 (Wakefield)** R session: Reading in data, EDA, plotting and packages
- ▶ Mon 9:20–9.40: **Break**
- ▶ Mon 9:40–10:30: **Lecture 2 (Waller)** Initial examinations of spatial data; Questions that can be asked. Introduction to GIS
- ▶ Mon 10:30–11:00: **Practical Session 2 (Waller)** R session: Mapping
- ▶ Mon 11:00–11:30 **Lunch Break**
- ▶ Mon 11:30–12:20: **Lecture 3 (Waller)** Point processes;  $K$  functions
- ▶ Mon 12:20–12:50: **Practical Session 3 (Waller)** R session
- ▶ Mon 12.50–13.10: **Break**
- ▶ Mon 13:10–14:00: **Lecture 4 (Waller)** Spatial regression. Slippery slopes: spatially varying coefficients.
- ▶ Mon 14:00–14.30: **Practical Session 4 (Waller)** R session NY Leukemia Data.

# Course Outline

## DAY 2 (Tuesday 13 July):

- ▶ Tue 8.00–8.50: **Lecture 5 (Wakefield)** Disease mapping for area data.
- ▶ Tue 8.50–9.20: **Practical Session 5 (Wakefield)** R session: Examples including Scottish lip cancer data.
- ▶ Tue 9.20–9.40: **Break**
- ▶ Tue 9.40–10.30: **Lecture 6 (Wakefield)** Disease mapping for point data.
- ▶ Tue 10.30–11.00: **Practical Session 6 (Wakefield)** R session: Examples.
- ▶ Tue 11–11.30 **Lunch Break**
- ▶ Tue 11.30–12.20: **Lecture 7 (Wakefield)** Clustering and cluster detection for count data.
- ▶ Tue 12.20–12.50: **Practical Session 7 (Wakefield)** R session: Examples including North Carolina SIDS data.
- ▶ Tue 12.50–13.20: **Break**
- ▶ Tue 13.20–14.00: **Lecture 8 (Wakefield)** Ecological bias.
- ▶ Tue 14.00–14.30: **Practical Session 8 (Wakefield)** R session: No specific notes for ecological bias, but continuation of previous examples.

# Course Outline

## DAY 3 (Wednesday 14 July):

- ▶ Wed 8:00–8.50: **Lecture 9 (Wakefield)** Disease dynamics/infectious diseases; illustrated with measles and flu examples.
- ▶ Wed 8.50–9.20: **Practical Session 9 (Wakefield)** R session: epidemic/endemic models
- ▶ Wed 9:20–9.40: **Break**
- ▶ Wed 9:40–10.30: **Lecture 10 (Wakefield)** Prevalence mapping
- ▶ Wed 10:30–11:00: **Practical Session 10 (Wakefield)** R session: HIV prevalence in Malawi using DHS data
- ▶ Wed 11:00–11.30: **Break out session**

# Spatial books

- ▶ Baddeley, A., Rubak, E. and Turner, R. (2015). *Spatial Point Patterns: Methodology and Applications with R*, CRC Press. Technical.
- ▶ Banerjee, S., Gelfand, A.E. and Carlin, B.P. (2014). *Hierarchical Modeling and Analysis for Spatial Data, Second Edition*, CRC Press. Technical.
- ▶ Blangiardo, M. and Cameletti, M. (2015). *Spatial and Spatio-Temporal Bayesian Models with R-INLA*, John Wiley and Sons. Technical, and focussed on models that can be with the integrated nested Laplace approximation (INLA) method.
- ▶ Bivand, R.S., Pebesma, E.J. and Gómez-Rubio, V. (2013). *Applied Spatial Data Analysis with R, Second Edition*, Springer. The definitive guide to GIS in R but not an easy book to learn from, unless already proficient in R.
- ▶ Brundson, C. and Comber, L. (2015). *An Introduction to R for Spatial Analysis and Mapping*. Sage. Good introductory level, but not much on analysis. More descriptive/exploratory/visualization.
- ▶ Darmofal, D. (2015). *Spatial Analysis for the Social Sciences*. Cambridge. As the title suggests, specific to the social sciences.
- ▶ Diggle, P.J. (2013). *Statistical Analysis of Spatial and Spatio-Temporal Point Patterns*. CRC Press.
- ▶ Diggle, P.J. and P.J. Ribeiro (2007). *Model-Based Geostatistics*, Springer.
- ▶ Elliott, P., Wakefield, J., Best, N. and Briggs, D. (2000). *Spatial Epidemiology: Methods and Applications*, Oxford University Press.
- ▶ Gelfand, A.E., Diggle, P.J., Fuentes, M. and Guttorp, P. (2010). *Handbook of Spatial Statistics*, CRC Press.
- ▶ Haining, R. *Spatial Data Analysis: Theory and Methods*, Cambridge.

- ▶ Lawson, A.B. (2006). *Statistical Methods in Spatial Epidemiology, 2nd Edition*, John Wiley and Sons.
- ▶ Lawson, A.B., Browne, W.J. and Rodeiro, C.L.V. (2003). *Disease Mapping with WinBUGS and MLwiN*, John Wiley and Sons.
- ▶ Schabenberger, O. and Gotway, C.A. (2004). *Statistical Methods for Spatial Data Analysis*, CRC Press. More on the theory side.
- ▶ Shaddick, G. and Zidek, J. (2015). *Spatio-Temporal Methods in Environmental Epidemiology*, CRC Press.
- ▶ Stein, M.L. (1999). *Interpolation of Spatial Data: Some Theory for Kriging*, Springer. Theoretical and concentrates on geostatistical models.
- ▶ Waller, L.A. and Gotway, C.A. (2004). *Applied Spatial Statistics for Public Health Data*, Wiley, New York. A very good book, at an intermediate level.
- ▶ Ward, M.D. and Gleditsch, K. S. (2008). *Spatial Regression Models*. Sage. Webpage, containing data and R code: [http://privatewww.essex.ac.uk/~ksg/srm\\_book.html](http://privatewww.essex.ac.uk/~ksg/srm_book.html)